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ABSTRACT

The American Lung Association of Los Angeles County developed the SAFE-AT-HOME curriculum to teach preschool children home safety concepts through early childhood group experiences. This report evaluates the efficacy of the curriculum by testing 2 experimental and 2 control groups of children from 34 preschool classes on fire, water, foreign ingestion, and general lung safety. Experimental subjects participated in 30 game-like safety lessons over a 2-month period. The curriculum emphasized concrete educational experiences to help the children establish cause and effect connections between safe practices and fire, water, and hazardous materials that youngsters might ingest. The activities were presented within the context of the regular preschool program at times and locations of the teachers' choice. Pretests and posttests were conducted according to the Solomon research design. Analysis of variance of posttest scores resulted in very significant differences among groups, later confirmed by a "t" test between gain scores of the 2 pretested groups. Results of the evaluation indicate that, by participating in SAFE-AT-HOME, children at the preschool level were more aware of safety measures than children who did not participate. (DR)

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CAN PRESCHOOL CHILDREN LEARN SAFETY SKILLS?
EVALUATION OF THE SAFE AT HOME CURRICULUM

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ABSTRACT

Although accidents are the leading cause of injury and death to children, and two-thirds of all childhood accidents occur at home, very little curriculum has been available to teach home safety concepts to children through early childhood group experiences. The American Lung Association of Los Angeles County addressed this problem by developing the SAFE-AT-HOME curriculum focused on fire, water, and foreign ingestion safety. An evaluation was conducted comparing 2 experimental and 2 control groups of preschool children from 34 classes on the targeted concepts. Experimental subjects participated in 30 game-like safety lessons over a two month period.

Pretests and posttests were conducted according to the Solomon reseach design. Analysis of variance (ANOVA) of posttest scores resulted in very significant differences ($p<.002$) among groups, later confirmed by a "t" test between gain scores of the 2 pretested groups ($p<.04$). ANOVA of posttest scores of experimental groups by age also resulted in significant differences ($p<.06$), with all ages showing improvement.

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INTRODUCTION

Death rates of children from communicable and chronic diseases have decreased markedly in the last sixty years, yet death rates due to accidents have not apprciably changed during that time[1]. Today, accidents are the leading cause of injury and death to children, accounting for approximately 40% of all deaths of children 1-4 years of age[2,3]. At these ages, accidents are responsible for over three times as many deaths as result from congenital anomalies and about 11 times the number of deaths from influenza and pneumonia[4]. Estimates show that 91% of the accidents to children under 5 years of age take place in the home[5]. Accidental injuries to children exact a high price in health care and rehabilitation costs, lost time from school, lost time from work for parents, permanent disability, and poor health and educational development[6].

Those victims who are fortunate enough to survive home accidents often suffer from chronic lung problems as a result of smoke inhalation, near drowning, or dangerous ingestions. The American Lung Association of Los Angeles County has a special interest in prevention and emergency procedures for such lung-related accidents.

Most efforts to decrease early childhood accidents in the home have focused on parent education: primarily, encouraging the parent to use passive safety devices such as electrical socket covers, to provide supervision, and to take other safety precautions. These programs have not resulted in lasting changes in parental behaviors [7,8,9,10]. Noting the poor record of success in achieving safety goals through parent education, the American Lung Association of Los Angeles Coundty decided to try a different approach: namely, direct

instruction of the children, themselves.

Although children are not always in control of the accident environment, there are many situations in which it is their own activities that cause injury (e.g. playing with matches, swimming without an older person present). Direct instruction has the potential of creating self-controls against hazardous behaviors. Additional safeguards are provided if children know preferred procedures to follow during an emergency. There is even some evidence that teaching the children is an indirect way to influence parents to change some of their behaviors.

While resource materials are available to teach specified safety concepts to young children, no integrated curriculum was known to be available that addressed the concepts targeted for this project (See Figure 1). Yet, there is increasing evidence that children can learn how to protect themselves against a variety of problems. Children, for instance, are the focus of numerous curricula designed to teach safety concepts ranging from car passenger behavior[11, 12, 13] to prevention of nuclear war[14]. They are also encouraged to participate in their own wellness through good nutrition and fitness habits[15].

The result of these observations and concerns was the development and evaluation of the SAFE-AT-HOME curriculum. Designed for classroom presentation in early childhood settings, the curriculum was based upon the educational premises of Piaget and Gelman.

Piaget[16] addressed a number of issues pertinent to education of preschool children. Of special importance to this study were conclusions concerning the type of learning experience appropriate to the preoperational stage of cognition, thought to dominate the

thinking of children from around age 2 until approximately age 7. Specifically, Piaget advised that children within this stage actively struggle to understand their environment by manipulating concrete objects rather than highly symbolic material. His followers[17,18] have emphasized the importance of activity-based teaching strategies. These recommendations are consistent with the advice of many other preschool educators.

A notion of cause and effect is also important to children's understanding of safety. Gelman[19,20] concluded that even at the age of 3 or 4 years, children associate cause with effect and make accurate predictions based on causal principles. Familiarity with the phenomena under consideration is an important factor in accurate causal explanations, according to her research.

Drawing from the recommendations of these researchers, a curriculum was developed using concrete educational experiences. It was hypothesized that the activities of the curriculum would establish cause and effect connections in the minds of children between safe practices and fire, water and materials that the youngsters might ingest and which have been demonstrated to be hazardous.

METHOD

The SAFE-AT-HOME evaluation study included 30 game-like experiences for children. The activities featured fire, water, foreign ingestion and general lung safety lessons to be presented within the context of the regular preschool program at times and locations of the teacher's choice. Many activities were open-ended

to allow children to respond at their individual developmental levels. All lessons use concrete materials. Each lesson provided the teacher with all the information needed to plan, construct and implement the activity in the classroom. Targeted safety concepts are listed in Figure 1.

Insert Figure 1 About Here

Thirty-four preschool classes were solicited to participate in the SAFE-AT-HOME field study. The classes were divided into four groups, matched as to their organizational connections: HeadStart, public Childrens' Centers, non-sectarian private schools and sectarian private schools. The four comparison groups were randomly assigned to treatment conditions as designated by the Solomon research design to provide maximum control of external and internal variables (Figure 2). Teachers of the classes in groups 1 and 2 that

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Insert Figure 2 About Here

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were presented with the lessons received a one hour inservice education on SAFE-AT-HOME before the field evaluation was initiated. The curriculum was presented to the children over a two month period.

In order to evaluate the effectiveness of the curriculum, children in the field study were interviewed and graded on their knowledge of the targeted safety concepts within two weeks before and after experiencing the unit of study or the control education, as designated in the research paradigm. The project-designed interview included a number of questions to which the children responded by

manipulating dolls or pointing to visual image choices. Each child was interviewed individually by university students who had been trained for reliability in presenting and scoring the interview.

A separate one-way analysis of variance (ANOVA) and Tukey test of multiple comparisons were used to identify differences in performance on the posttest interviews by treatment (experimental or control). A grand total of 264 children began the field evaluation. Of these, 39 children could not be evaluated on the posttest because of absence or removal from class by the posttest dates. The groups were further reduced in size for the ANOVA of the posttest scores by treatment in order to assure equal numbers within each group. This was accomplished by casting out subjects using a random table of numbers until each group contained 37 subjects for a total N of 148.

The pretest to posttest gain scores between Experimental Group 1 and Control Group 3 were analyzed using a `t´ test, to determine if there was a significant difference in gains between the experimental and control groups. Means were inspected to determine the direction of differences.

Finally, the effects of age on posttest scores was determined by an ANOVA and a Tukey test of multiple comparisons of experimental groups 1 and 2. All members of experimental groups 1 and 2 were included in this analysis, including those who were cast out by random number for the ANOVA of treatment effects (N=138).

FINDINGS

ANOVA of post-test data by treatment yielded a significance of $p<.002$ (Table 1). The Tukey test of multiple comparisons and inspection of means showed that Experimental Group 1 was significantly higher than Control Group 4, but not significantly different than Experimental Group 2 or Control Group 3 (Table 2). The similarity between the two experimental groups was expected, but the lack of significance between the experimental groups and control group 3 was not anticipated. Consequently, gain scores were analysed in an attempt to explain this result.

Insert Tables 1 and 2 About Here

The "t" test of gain scores between experimental group and control group 3 resulted in a significant difference at $p<.004$ (Table 3). Inspection of means showed that Experimental Group 1 gains were greater than Control Group 3 gains. Still, the children in Control Group 3 made considerable gains in their scores between the pretest and posttest, even though they did not experience the treatment.

Insert Table 3 About Here

All ages 3 to 5 of children in the treatment groups improved their scores from pretest to posttest. ANOVA of experimental posttest scores by age revealed that age was significant to performance at the $p<.06$ level (Table 4). A Tukey test of multiple comparisons (Table 5) and inspection of means indicated that the

three year old children had significantly lower scores (M=39.5) than the five year old group (M=47.3) The four year old group fell between, but was not significantly different than either of the other groups (M=43.7). The older children scored higher than the younger children, but did not "top out" on the test. The maximum number of points available were 56.

Insert Tables 4 and 5 About Here

CONCLUSIONS AND RECOMMENDATIONS

By participating in SAFE-AT-HOME, children at the preschool level were able to improve their knowledge of safety measures compared to children who did not receive the program. This improvement was demonstrated by highly significant differences in posttest scores between Control Group 4 and Experimental Groups 1 and 2. Posttest scores of Control Group 3 were not significantly different than scores of the experimental subjects. A subsequent analysis of gain scores between Groups 1 and 3 (the 2 groups that were pretested) indicated that there was, nevertheless. a significant difference in advancement between the two groups in favor of the experimental group.

The most plausible explanation for the seeming contradiction between the lack of significance of posttest scores and significant difference in gain scores is that the pretest interview scores were somewhat higher for Control Group 3. Thus, a relatively small gain over the course of the experiment elevated the posttest interview

scores to a position not unlike the posttest scores of Experimental Group 1, which actually made a greater advance.

The differences between posttest scores of Control Group 3 and the Experimental Groups may have been further minimized by the children learning from the pretest, itself. Test-wiseness would be supported by the difference in posttest scores of Group 3 and Group 4. The latter group was not pretested and scored lower. The unpretested experimental group also scored lower than the pretested experimental group, although not significantly.

Another possible explanation of gain in Control Group 3 could be research contamination. Teachers from a common facility but different treatments may have shared lesson plans or left materials where they were available to control group children.

The SAFE-AT-HOME program seemed well-suited to the preschool age level, as indicated by gains in the scores of 3, 4, and 5 year old children. Since no 5 year old child came close to a perfect score on the posttest interview, and since high scores were directly correlated with age, it appears that the curriculum would very likely be appropriate for kindergarten and early elementary school children, as well as preschoolers.

The leap from knowing safety concepts to using them is a giant step. Obvious practical considerations prevent testing safety behavior related to the concepts. Since awareness is a recognized precursor to action, however, it seems plausible that learning safety concepts predisposes young children to adopt safer practices.

No measurement was attempted of the impact of the SAFE-AT-HOME project on parents and the home environment. It is recommended that future studies assess the results on parents of safety programs

directed to children. Another study that is needed, is a long-term follow-up to ascertain retention of the safety concepts learned.

Despite the limitations cited, it can be said that the results of this safety program for young children were encouraging. Direct instruction of preschoolers in safety concepts appears to be a reasonable alternative or adjunct to parent safety education. A goal for the future might be to develop a comprehensive safety program to begin in preschool and continue throughout the elementary grades.

Figure 1
Concepts Featured in SAFE-AT-HOME Curriculum

Focus	Teaching Objective
Lungs	Everyone has lungs
	Lungs take-in and expel air
	Foreign materials in lungs impair breathing
	Lungs need clean air to function properly
Fire	Fire has many uses
	Identification of fire suppressants
	Firefighters are friends
	Stop, drop and roll if clothing is ignited
	Crawl under smoke
	Employ precautions against burns, scalds
Water	Learn to swim
	Swim with an adult swimmer present
	Get help if swimmer is in distress
	Sit down, wear life preserver in boats
	Wear clothing that is weather-appropriate
	Identify objects that float and sink
Foreign Ingestions	Sit down while you eat
	Chew food well
	Wash hands before handling food
	Know what you are eating
	Some substances should not be put in mouth
	Choose to be in the cleanest air

Figure 2
SAFE-AT-HOME Field Test Research Design

Group	N	Pretest Given	Curriculum Presented	Posttest Given
1	37	X	X	X
2	37		X	X
3	37	X		X
4	37			X

Table 1
ANOVA; Posttest Scores by Four Groups

	df	Sum of Sq.	Mean Sq.	F	p<
Main Effects	3	1119.988	373.329	5.236	.002
Residual	144	10267.083	71.299		
Total	147	11387.071	77.463		

N=148 (4 equal groups of 37)

Table 2
Tukey Test of Multiple Comparisons
Post Scores by Group

Group	N	Mean	SD	SE
1	37	45.93*	7.66	1.26
2	37	42.82	9.22	1.52
3	37	42.11	7.05	1.16
4	37	38.21*	9.58	1.57

*p<.05

Table 3
T-Test of Gain Scores of Pretested Groups

Group	N	M	SD	SE
Experimental Group 1	37	13.7	7.9	1.3
Control Group 3	37	8.4	7.4	1.2

F=1.13
p<.004

Table 4
ANOVA; Posttest Scores of Experimental Groups by Age

	df	Sum of Sq	Mean Sq	F	p<
Main Effects	2	507.046	253.52	2.856	.06
Residual	135	11984.950	88.77		

N=138

Table 5
Tukey Test of Multiple Comparisons
Post Scores of Experimental Groups by Age

Group	N	Mean	SD	SE
3 yr.	14	39.54*	11.09	2.96
4 yr.	103	43.71	9.67	.95
5 yr.	21	47.26*	6.55	1.43

*p<.05

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